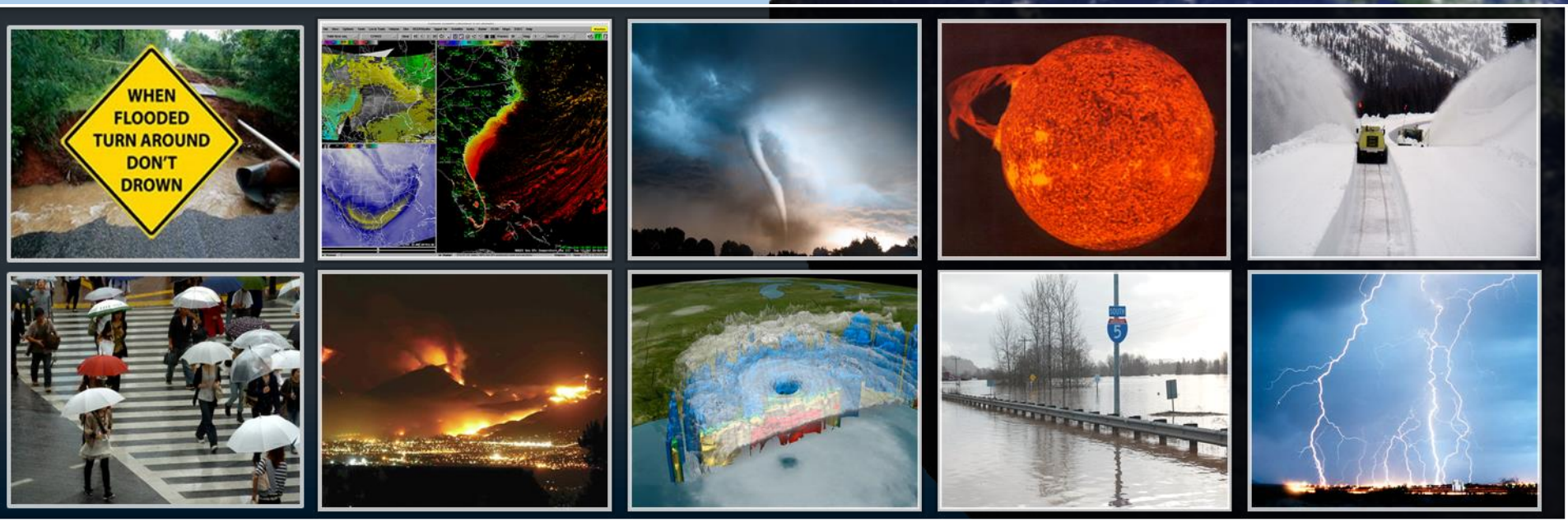
Building a Weather-Ready Nation

NWS Partners Meeting – Technical Session
January 14, 2016 • New Orleans, LA



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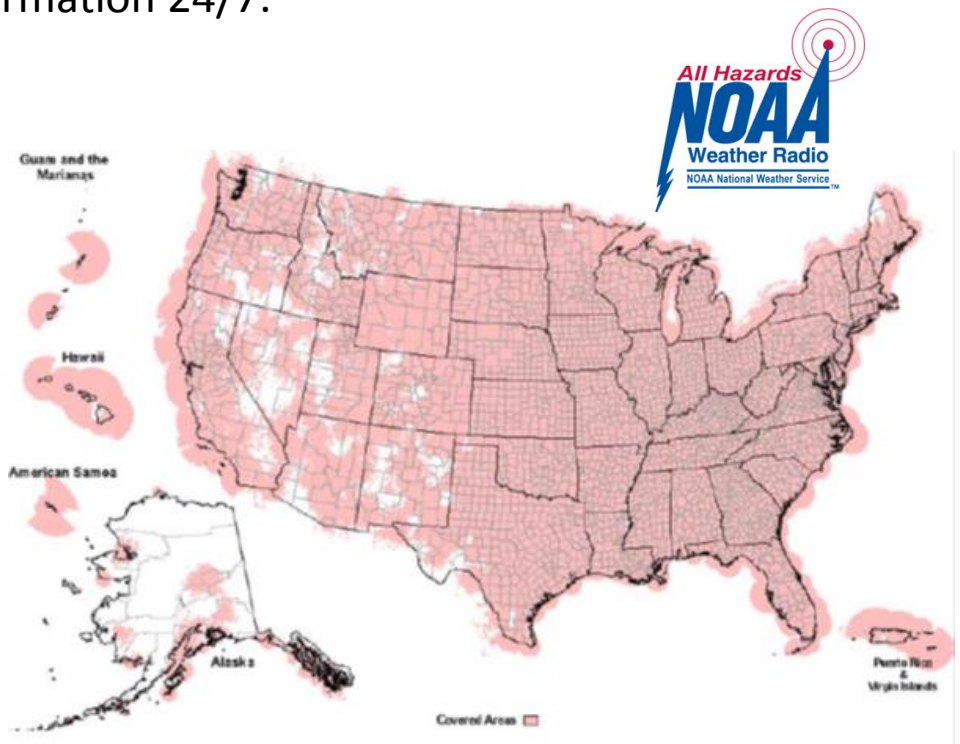
NOAA Weather Radio All Hazards (NWR) is a multi-mission program serving a variety of users, markets and the nation using broadcast Radio Frequency technology. Since the mid-50s NWR has been broadcasting continuous weather information and official warnings, watches, forecasts and other hazard information 24/7.

Challenge: NWR is currently outpaced by technological advancements in accuracy and targeting of other dissemination media. Additionally, NWR is not sustainable in its current model as a $13 million/yr. program with costs escalating about +7% per year.

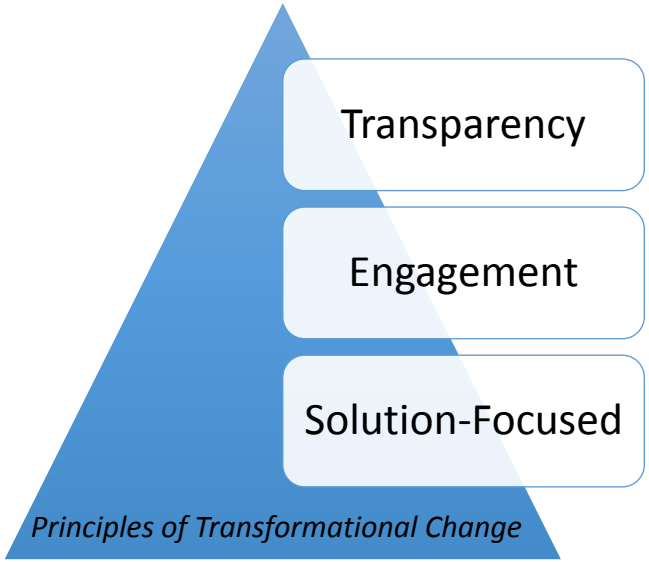
Opportunity: The Transformational Change (TC) process provides NWS the opportunity to meaningfully engage with partners to design and develop a replacement system that will be capable of supporting multiple dissemination platforms.



NOAA Weather Radio All Hazards Coverage

Dissemination Technical Services:
NOAA Weather Radio Transformational Change

What is Transformational Change (TC)?: TC is an objective and transparent decision-making process to guide significant organizational and operational changes within the NWS.



What is Stakeholder Engagement?: A process using social science methods to involve key NWR stakeholders in action-oriented dialogue for the purpose of obtaining relevant, key user requirements for the design, development and implementation of a new future NWR All Hazards network.

<u>Stakeholder Engagement Objectives</u>:

1) Identify NWR user needs by engaging stakeholders across the Weather enterprise
2) Determine future NWR system requirements through analysis of user needs
3) Identify emerging technologies to augment and/or replace obsolete equipment
4) Provide a viable, sustainable path forward for NWR.

Dissemination Technical Services:
NOAA Weather Radio Transformational Change

Anticipated Benefits:

- On-going communication and interaction with key NWS stakeholders to maintain strong relationships with partners
- A solid, focused user requirements document to serve as the 'blueprint' to build a better NWR – agile and sustainable
- Significant contribution to mission goals – working with partners to build a society that is prepared for and responds properly to weather-dependent events and risks.

Next Steps:

- Participation in NWS Customer Satisfaction Survey and provide initial input into the process (Jan. 18-31, 2015)

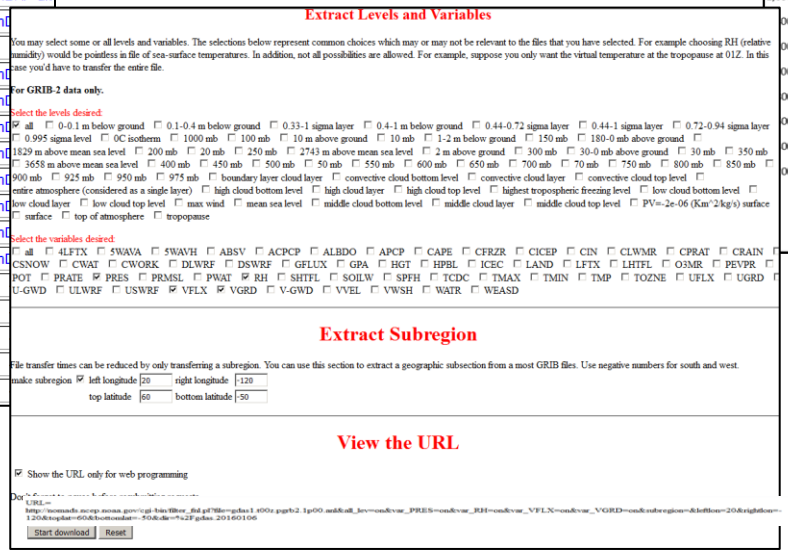
Dissemination Technical Services

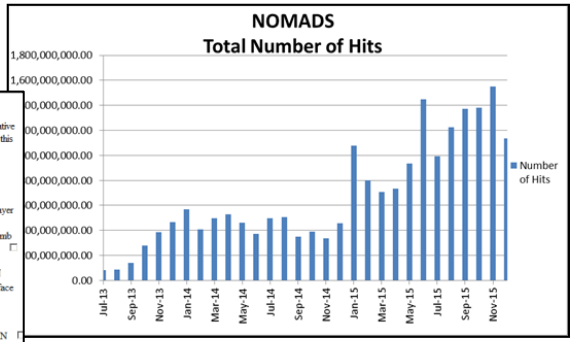
NOAA National Operational Model Archive and Distribution System (NOMADS) and FTPPRD

NOAA **National Operational Model Archive and Distribution System (NOMADS)** enables access to Numerical Forecast Guidance data, tailored to user needs. The Data is downloaded via Grib Filter and OpenDAP Methods. The data available includes Global Models, Ensemble Models, Regional Models, Ocean Models, a subset of non-NOAA models, and models undergoing a 30-day evaluation.

FTPPRD is a site with access to full GRIB2 model data only / no cut-splice-dice

Data Set	freq	grib filter	http	gds-alt
Global Models				
GDAS	6 hours	grib filter	http	OpenDAP-alt
GFS 0.25 Degree	6 hours	grib filter	http	OpenD
GFS 0.25 Degree (Secondary Parms)	6 hours	grib filter	http	
GFS 0.50 Degree	6 hours	grib filter	http	OpenD
GFS 1.00 Degree	6 hours	grib filter	http	OpenD
GFS Ensemble high resolution	6 hours	grib filter	http	OpenD
GFS Ensemble Precip Bias-Corrected	daily	grib filter	http	OpenD
GFS Ensemble high-resolution Bias-Corrected	6 hours	grib filter	http	OpenD
GFS Ensemble NDGD resolution Bias-Corrected	6 hours	grib filter	http	OpenD
NAEFS high resolution Bias-Corrected	6 hours	grib filter	http	OpenD
NAEFS NDGD resolution Bias-Corrected	6 hours	grib filter	http	OpenD
NGAC 2D Products	daily	grib filter	http	
NGAC 3D Products	daily	grib filter	http	
NGAC Aerosol Optical Depth Products	daily	grib filter	http	
Climate Forecast System Flux Products	6 hours	grib filter	http	
Climate Forecast System 3D Pressure Products	6 hours	grib filter	http	





NOMADS: http://nomads.ncep.noaa.gov/ FTPPRD: http://ftpprd.ncep.noaa.gov/

NOMADS Parallel Models: http://para.nomads.ncep.noaa.gov

To sign up for the NOMADS mailing list, visit

https://www.lstsrv.ncep.noaa.gov/mailman/listinfo/ncep.list.nomads-ftpprd

Dissemination Technical Services
TGFTP

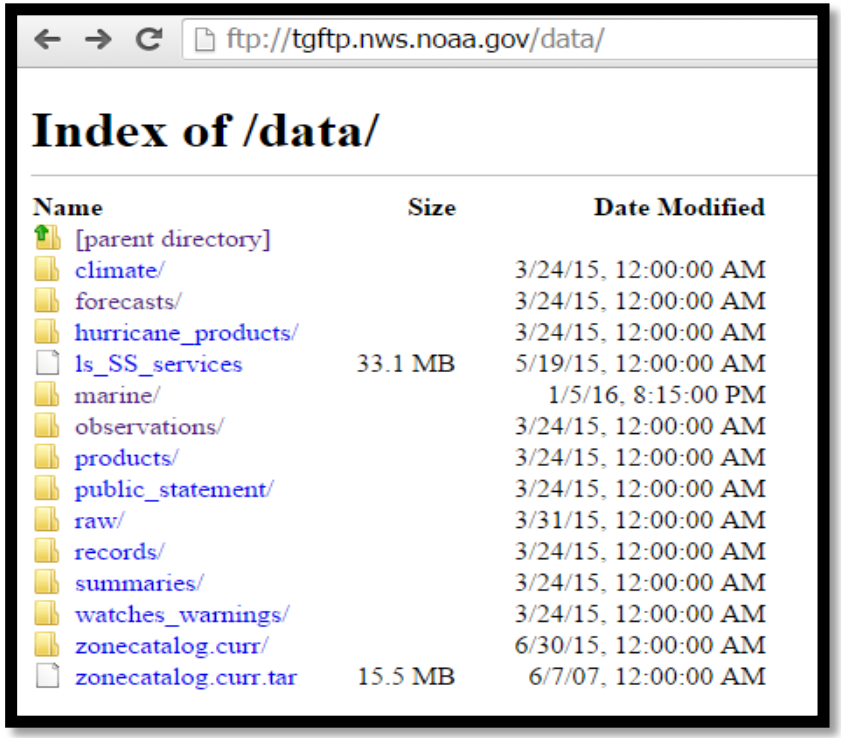
As part of the continuing **NWS Telecommunications Gateway (NWSTG)** application transition to IDP, NCEP transitioned the public **anonymous ftp services** from the legacy systems in Silver Spring to the IDP system in College Park, MD.

This ftp server also fulfills international commitments for data distribution and most importantly the migrated application provides backup capabilities for the first time for this service.

TGFTP Capabilities

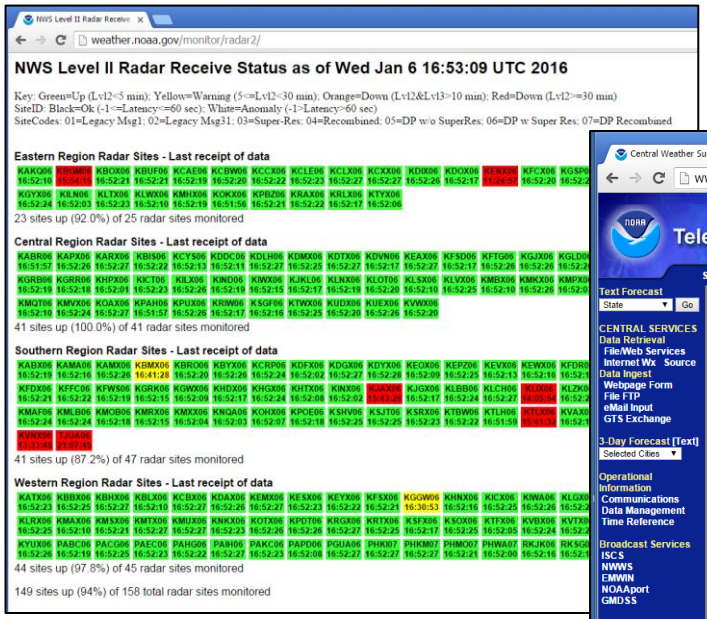
- Access to a variety of weather products including climate data, forecasts, observations, watches and warnings
- 100% backup capability
- Public access

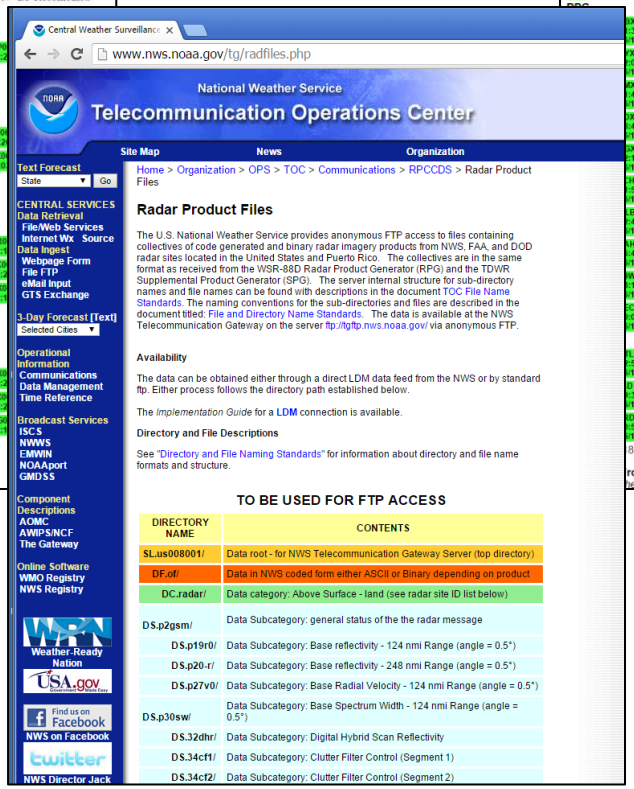
TGFTP is available at: ftp://tgftp.nws.noaa.gov/

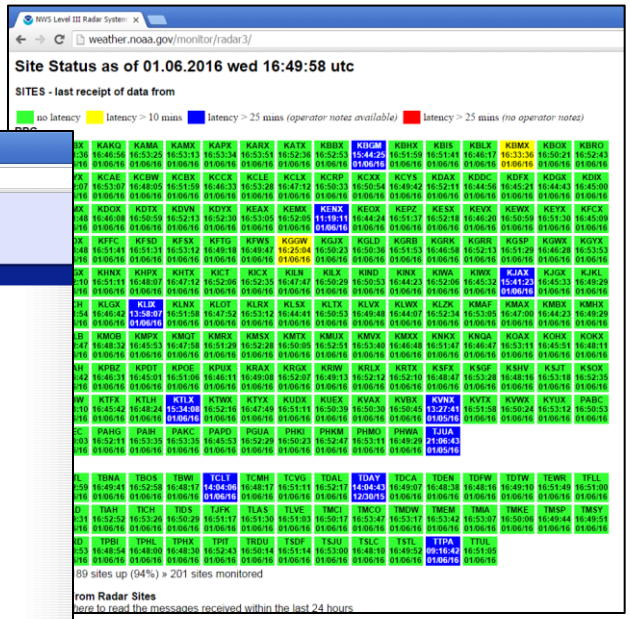


Dissemination Technical Services

Radar Level 2 and Radar Level 3







Radar Level II
migrated to IDP in early June

Radar Level III
migrated to IDP in early July

The latest Radar Level III data is available at: ftp://tgftp.nws.noaa.gov/SL.us008001/DF.of/DC.radar/

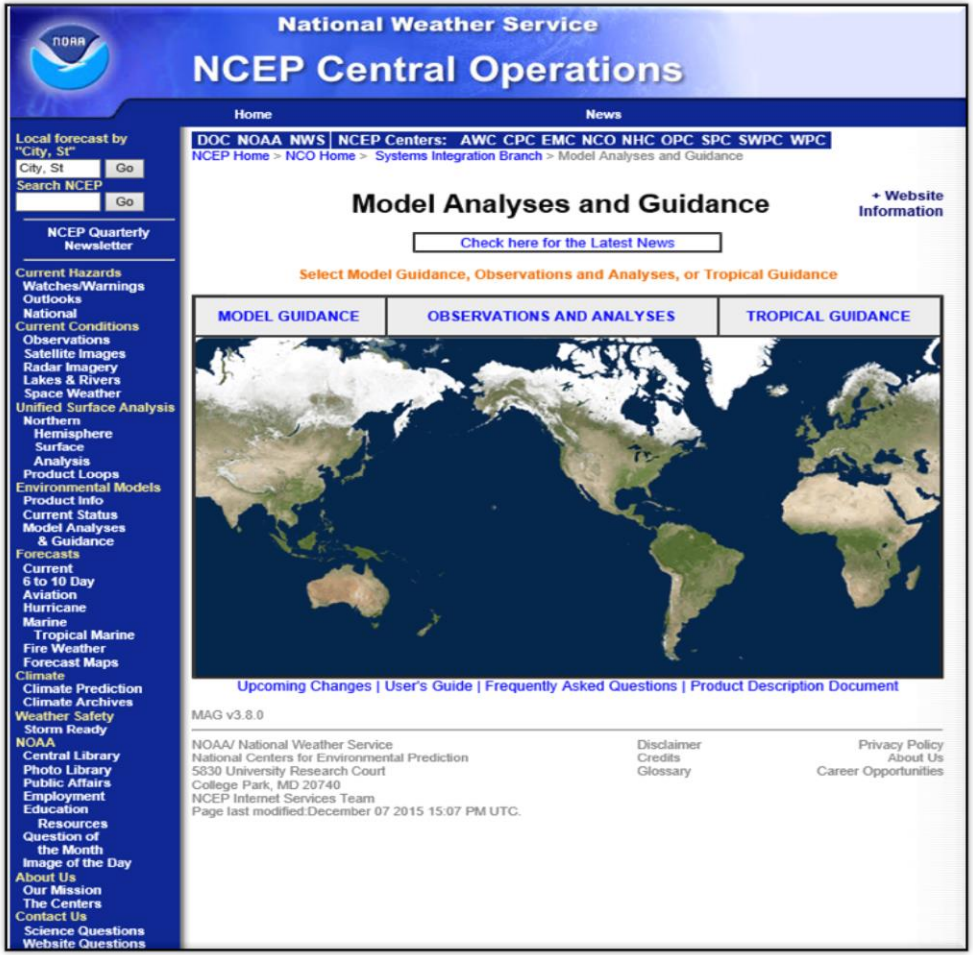
The latest Radar Level II data is available at: http://www.ncdc.noaa.gov/nexradinv/choosesite.jsp

Dissemination Technical Services
Model Analysis and Guidance (MAG)

The Model Analysis and Guidance (MAG) website displays GIF (Graphical Interchange Format) images of the output of NCEP's weather prediction models; observational data in the form of SKEW-T and station plots; output from the Real Time Data Analysis model and hurricane model information when storms are active.

The application runs in two environments:

1. The Weather and Climate Operational Supercomputer System (WCOSS) to consume gridded model data and produce images.
2. A public facing Web Server farm where web navigation code provides an organized interface to the data and a set of bookmark able URLs that customers can use to directly access the latest images.

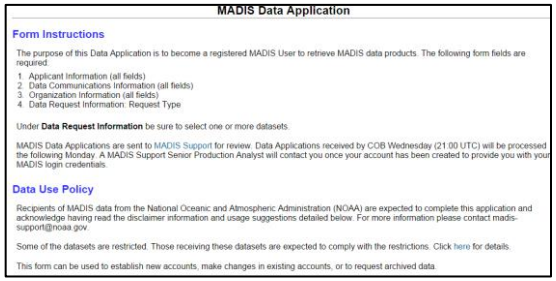


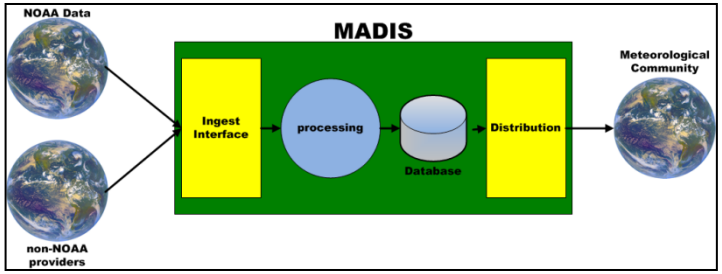
The Model Analyses and Guidance (MAG) website is available at http://mag.ncep.noaa.gov

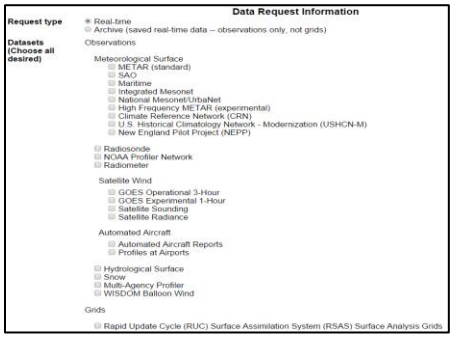
Dissemination Technical Services

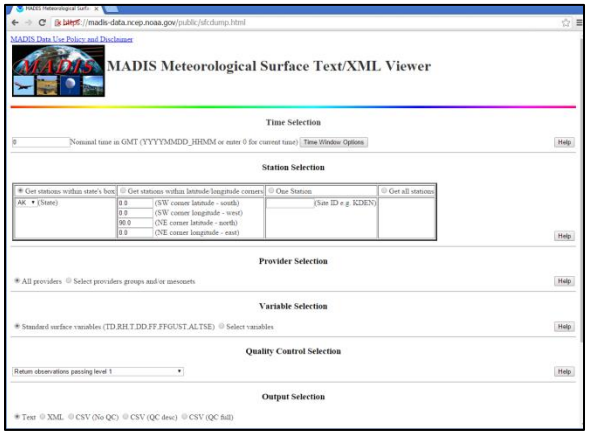
Meteorological Assimilation Data Ingest System (MADIS)

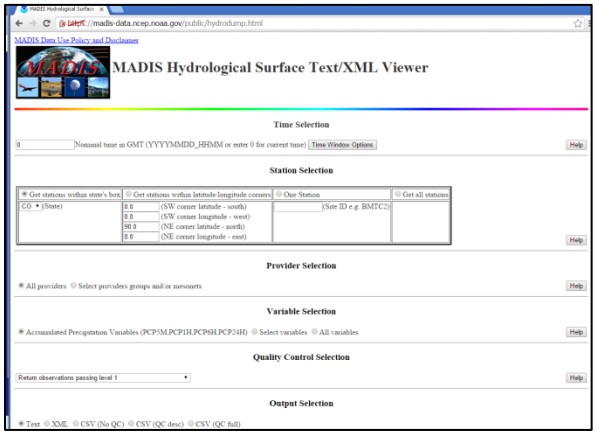
The **Meteorological Assimilation Data Ingest System (MADIS)** is a high-resolution (spatially & temporally) global data ingest, integration, Quality Control (QC), and delivery system.











The data sets are available via HTTP, FTP and LDM. A web form for requesting specific data may be found at https://madis-data.ncep.noaa.gov/madis_datasets.shtml

Users must be registered for all levels of access to the data and should contact the MADIS Helpdesk at madis-support@noaa.gov. The Helpdesk will also assist users who require FTP or LDM access to the data.

Dissemination Technical Services

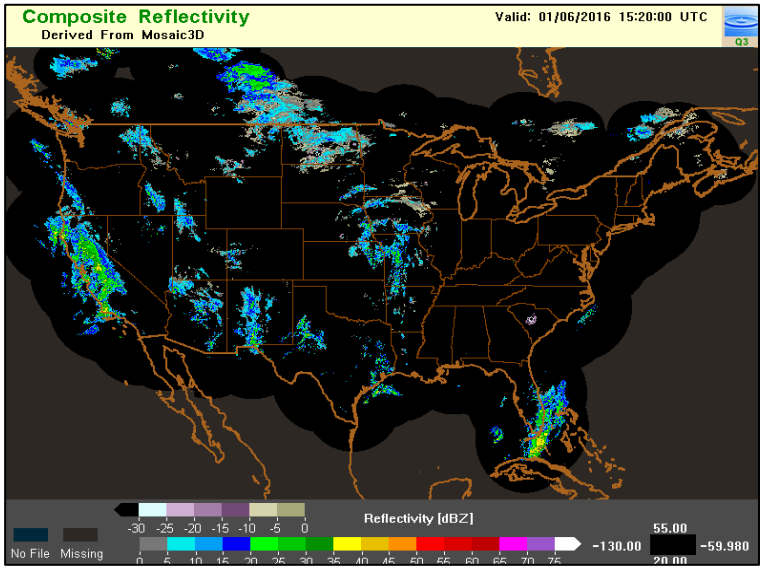
Meteorological Assimilation Data Ingest System (MADIS)

Services	Current Capabilities	Future Capabilities
High Resolution Meteorological and Hydrological Data	Mesonet, Hydro, Maritime, METAR, Profiler, Aircraft Based Observations (ABO) , Mobile Platform Environmental Data (MoPED), Snow, Radiometer, and Satellite(Winds, Sounding, and Radiance)	Hydrological Automated Data System (HADS)/Automated Flood Warning System (AFWS), SNOw TELemetry (SNOTEL), One Minute ASOS, *Clarus* (Atmospheric and Road Weather data), TAMDAR, EDR, and WVSS
Understanding of Observation and Observation Quality	MADIS currently collects and stores limited observational metadata which limits the rough quality checks that can be performed on the observations.	MADIS is working with the National Mesonet (NM) program and *Clarus* on improved metadata. MADIS is working to build a Quality Control sandbox that will support the current MADIS QC and once implemented the *Clarus* QC.
Data Delivery	MADIS currently supports ftp, ldm, and https protocols. MADIS netCDF files are available using ftp and ldm. Text, CSV, and XML formats are available using https. MADIS provides graphical interfaces for viewing MADIS surface and hydro data sets.	MADIS will add the ability for users to receive HADS/AFWS and SNOTEL data in SHEF format. MADIS is working with NWS and the FAA on standardized data discovery and delivery methods. MADIS is working to provide one graphical interface for displaying all MADIS data. MADIS is working to provide all data fully Qced within a minute of receipt.

Dissemination Technical Services
Multi-Radar/Multi-Sensor System (MRMS)

The National Severe Storms Laboratory's (NSSL) **Multi-Radar/Multi-Sensor System (MRMS)** was developed to produce severe weather and precipitation products for improved decision-making capability to improve severe weather forecasts and warnings, hydrology, aviation, and numerical weather prediction.

MRMS is a system with automated algorithms that quickly and intelligently integrate data streams from multiple radars, surface and upper air observations, lightning detection systems, and satellite and forecast models.



The data sets are available via a real-time LDM feed or HTTP access at http://mrms.ncep.noaa.gov/data/

For an LDM feed contact the IDP On-boarding Team at ncep.list.idp_support@noaa.gov

Descriptions of the MRMS data sets may be found at: http://www.nssl.noaa.gov/projects/mrms

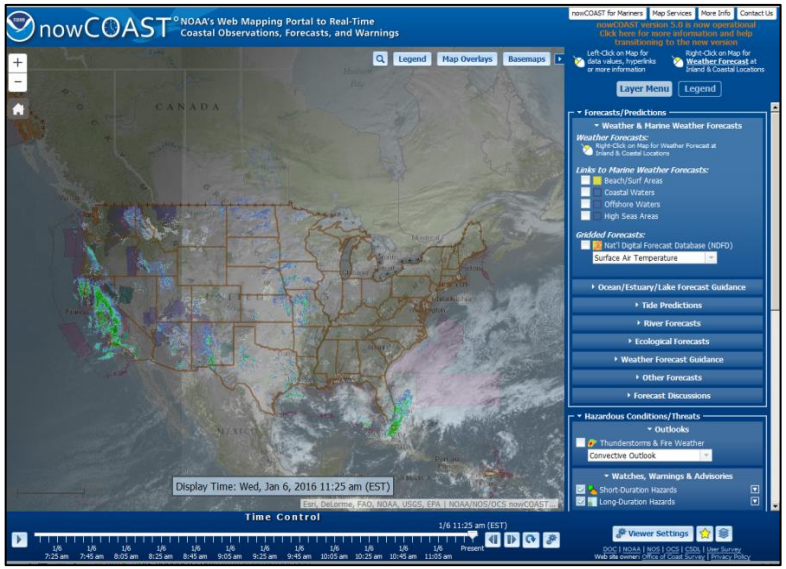
MRMS produces and issues a suite of more than 100 high resolution products over North American on a 1-km grid every 2 to 5 minutes. These data are used in weather forecast models, and for severe weather, aviation, and hydrometeorology forecasts.

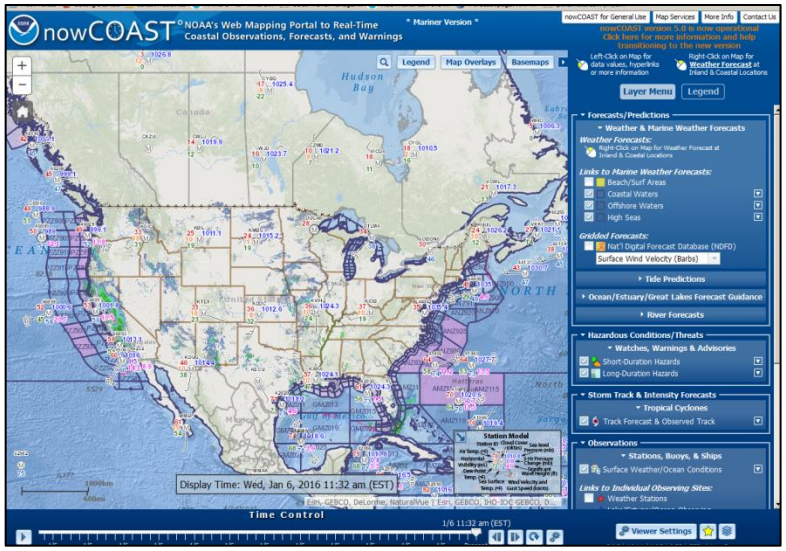
Dissemination Technical Services
IDP Geographic Information System (GIS)

The Integrated Dissemination Program (IDP) Geographic Information Systems (GIS) Project provides 7/24 access to NOAA data in Open Geospatial Consortium (OGC) compliant web service standard formats.

Services	Current Capabilities	Future Capabilities
NowCoast	Interactive viewer with two user interfaces, general interest and mariner. Time enabled services with ability to step the data through time via slider on the viewer. OGC compliant web mapping service include 60 NWS services.	Enhanced cartography based on user feedback during the August 2015 stability test. Additional NOAA data as web services and layers on the interactive viewer.
IDP GIS Services	Final stages of quality assurance for dynamic NWS web mapping services, in addition to those already available at NowCoast and NOS static services such as Environmental Sensitivity Indices.	Conduct 30 day stability test (Jan/Feb 2016) Services become Operational (Q2FY16)

Dissemination Technical Services
IDP Geographic Information System (GIS)



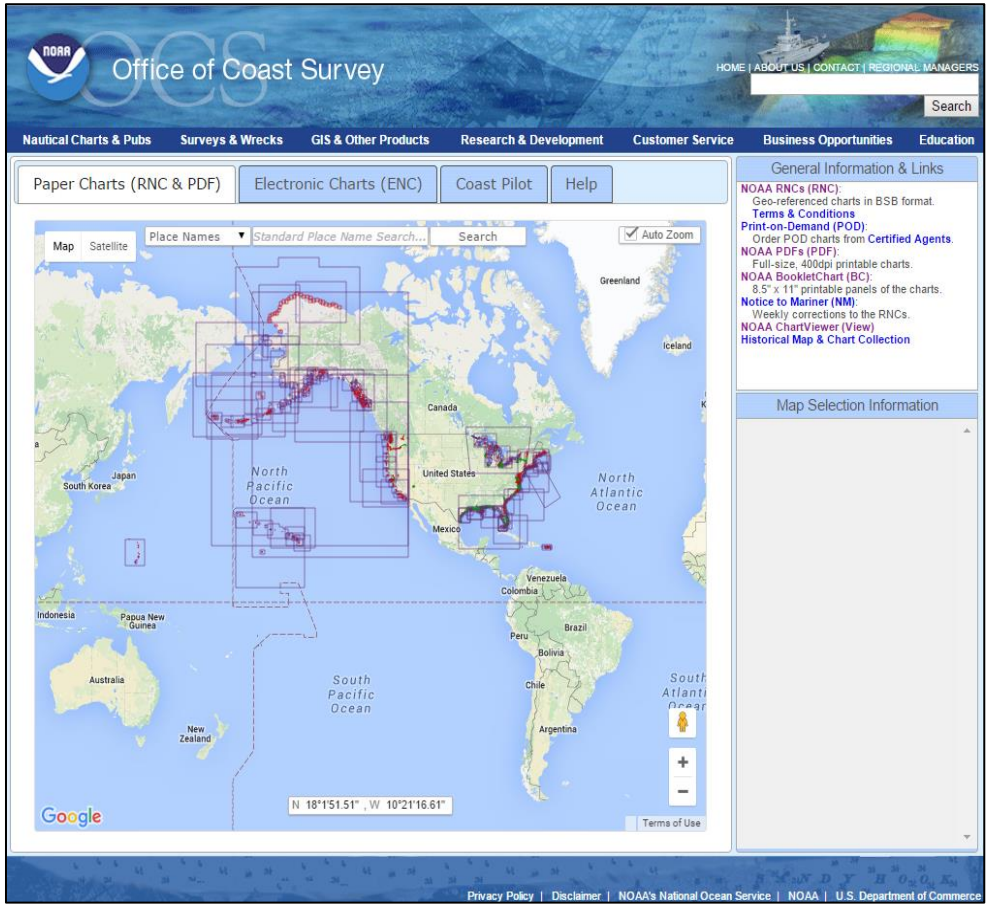


Dissemination Technical Services
National Ocean Service Chart Tile Service

The **National Ocean Service (NOS) Chart Tile Service** provides the public with access to, and information about, NOAA navigation products.

Services provided on the Chart Tile website include paper and digital charts such as Electronic Navigational Charts (ENCs) and Raster Navigational Charts (RNCs), which are graphical interfaces that allow you to view the outline of the area covered by each product.

In addition to ENC and RNC page graphical pages, there are text-only pages that provide direct access to the products available for download.



NOS Chart Tile is available at http://www.charts.noaa.gov/

Dissemination Technical Services
National Tsunami Warning Center Website

The National Tsunami Warning Center (NTWC) based in Palmer, Alaska provides tsunami watches, warnings and advisories affecting the Atlantic and Pacific coastlines of the United States and Canada as well as Puerto Rico and the Virgin Islands.

Given the importance of tsunami data, the NTWC currently hosts its website on IDP infrastructure in order to enhance the availability, performance, and reliability of its services.

The NTWC website is available at http://wcatwc.arh.noaa.gov/

Dissemination Technical Services
NWS Telecommunications Gateway

NWS Telecommunication Gateway (NWSTG) is the Nation's hub (24x7) for collection and distribution of extensive range of weather data and products (surface observations, models, radar imagery, satellite imagery, buoy data, watches and warnings, and forecasts). NWSTG is also the Region IV Global Information System Center (GISC).

Currently being migrated to the IDP Infrastructure as part of the NWSTG Re-architecture Project. The scope of the project includes a range of fundamental changes:

- Hardware (moving away from legacy hardware into a Virtual infrastructure)
- Software (transition into a standardized, common Operating System)
- Network infrastructure (activation and integration of the One-NWS Network)

	Current Capabilities	Future Capabilities
Enterprise Network	Limited capacity and infrastructure: Inadequate capacity to accommodate projected increases of satellite, model and radar data	Accommodate projected increases in satellite (e.g., GOES-R), model, and radar data by through use of the IDP infrastructure to provide a scalable, virtual, reliable and flexible network environment.
Backup Services	Limited backup capability: 74% backup operational capability that could result in more than 90% loss in weather observations and degraded forecast accuracy	With activation of the IDP data center located at the David Skaggs Research Center (DSRC) in Boulder, CO, a 100% backup capability for all NWSTG services will be ready to meet NWS WRN goals.

Family of Services
Background

Family of Services (FOS) partners uses legacy NWS services that will be decommissioned

- NWSTG in Silver Spring, MD and Fairmont, WV will be decommissioned in FY17 Q1 and NWSTG functions are being migrating to the IDP platforms in College Park and Boulder
- OPSNET will be decommissioned in FY17 Q4 and replaced with IDP's GRP One-NWS network

Cannot use FOS funding

- Funds arrive too late to be used and have continuing audit issues
- FY 15 FOS partnership agreement was not signed

Family of Services
Benefits and Challenges of Moving to IDP

Benefits	Challenges
Improved services with IDP ✓ Model (e.g., HRRR, GFS, SREF) ✓ Radar (e.g, MRMS) ✓ Satellite (e.g., GOES-R, JPSS) ✓ GIS (e.g., over 600 services with nowCOAST) ✓ IDSS (e.g., Impact Catalog) **Sustainable and Secure** ✓ Cost effective compared to OPSnet services ✓ Fixes security network issues by moving FOS partners behind the TIC and makes NWS OMB-08-05 compliant (assumes using the Internet) ✓ Simplifies network topology and routing; currently too many ingresses/egresses into the NWS network **Eliminates perceived favoritism to FOS partners from the broader Weather Enterprise partners**	**Potential changes to FOS business processing using new vs legacy services/products** **Bandwidth requirements may increase Internet access costs for some users** **FOS partners will need to make networking changes to route over their local Internet access points**  Mitigation: Full time IDP staff from NCEP Central Operations (NCO) available to guide transition from legacy services to IDP infrastructure

Migrating to IDP will provide existing FOS partners with improved services and help ensure reliable and affordable access to NWS products over the long-term.

Family of Services
IDP vs. FOS (Legacy NWSTG)

Service/Capability	IDP	FOS (Legacy NWSTG)
100% Backup	Yes College Park (FY14) & Boulder (FY16)	No Silver Spring, MD
Backbone	10 Gbps Physically Diverse (100 Gbps FY17)	45 Mbps Multiple single points of failure
TIC Compliant	Yes	No
Budget Sustainable	Yes	No
Model data	Yes - All	Partial – < 5% and decreasing
MADIS	Yes	No
MRMS	Yes	No
GOES-R/JPSS Readiness	Yes	No

THANK YOU!